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Description

The present invention pertains to apparatus for treating articles of manufacture. More particularly, the invention relates to doors and closures for treatment containers or barrels which may, for example, be adapted to be disposed in a tank of treating fluid.

The invention finds particular application in the art of electroplating and will be described with particular reference thereto. However, the invention is also applicable for cleaning, phosphating, rinsing and other treating operations.

A conventional plating barrel is filled with particulate workpieces or items to be plated or treated and is immersed in an electroplating or other highly corrosive treating fluid. The barrel is rotated within a tank of the treating fluid, whereby the items being treated cascade or tumble over each other in the interior of the barrel. The barrel interior is typically filled to approximately one-third to one-half of its volume and generally holds workpieces collectively weighing over one hundred pounds (45.4 kg) and, on certain occasions, holding workpieces collectively weighing as much as five hundred pounds (227 kg) or more. The barrels must be sufficiently durable and are constructed of a material adapted to withstand the usually corrosive effects of the treating fluid. Selected plastics have been used with commercial success.

The barrel has a generally circular sidewall and a pair of opposed flat head ends or endwalls defining a work cavity therein. Oftentimes, the cylindrically shaped barrel is formed of a plurality of panel members arranged in a hexagonal or octagonal relationship and secured by welding to the heads. One of the panels is left out of the welded arrangement and adapted or modified for selective removal and thereby function as a door. The removable panel provides access to the interior work cavity. Due to the extreme weight and various workpiece sizes subject to the treating process, a secure and close fitting arrangement is required between the door and the remainder of the barrel. The closure mechanism which holds the door closed must be sufficiently strong to withstand the weight of the cascading workpieces contained therein, sufficiently corrosion-resistant to withstand the treating fluids, and easy to operate.

By way of example, US-A- 2,886,505 illustrates a conventional clamping arrangement for holding a door in a closed position. As is evident, the door is substantially similar to the remaining panels defining the sidewall of the generally cylindrical container. Still other clamping arrangements are illustrated in US-A- 912,041 and US-A- 2,843,979. The apparatus described in both of these patents requies direct operator assistance in fastening and clamping the door in fixed, covering relation with the aperture and the remainder of the barrel. US-A-3,507,529 and US-A-3,583,739 are both directed to a door assembly for a plating barrel. Although applicable to use of automated machinery in lifting the door from the barrel, these arrangements necessarily require manual operator assistance to unfasten and remove the door from the opening. Even if adaptable to fully automated operation, the peripheral machinery necessary to unfasten and remove these doors from a barrel would be extremely complex and cost prohibitive.

One type of "hands-off" automatic door opening and closing apparatus for a barrel is exemplified in US-A-3,861,654. The door is designed for an arcuate movement between predetermined stop limits defining the door-open and door-closed positions. The type of structure illustrated in this patent has met with success. Nevertheless, it has been considered desirable to retain the benefits of a door which is recessed radially into the opening, as in the manual door arrangement, to prevent inadvertent sliding or falling out of the workpieces retained in the working cavity.

By way of example, electroplating small workpieces, such as washers or the like, requires close tolerances to be maintained between the door and the aperture. If a washer were to become lodged between the edge of the door and the remainder of the container, the washer would fail to be properly electroplated or escape from the container. Increased attention to quality control could potentially lead to rejection of a large number of workpieces under such a situation.

The present invention contemplates a new and improved door opening and closing apparatus for treatment barrels which provides an automatic "hands-off" operation along with the benefits of a close fitting recessed door arrangement.

According to the present invention, a simplified and economical automatic door assembly is provided for a treatment barrel or the like.

According to the invention, a rotatable container assembly for use in the surface treatment of particulate workpieces selectively enclosed therein, said container assembly comprising a generally cylindrical container having cylinder head ends retained in axially spaced relation by a sidewall and a work cavity defined therein, an aperture being formed in a minor portion of said sidewall for ingress to and egress from said work cavity and a door for said aperture; characterised in that the door includes an elongated portion adapted for selective covering relation with said aperture and at least one door end plate extending generally perpendicular from said elongated portion and operatively engaging said container and in that a gear in facing relation with said end plate has a cam slot

or cam follower co-operating with a cam follower or a cam slot on said end plate and adapted to impart arcuate and radial movement to said door (44) for selective covering of said aperture.

According to another aspect of the invention, the endplate includes an elongated cut-out adapted for sliding engagement with a trunnion operatively associated with the container.

According to a further aspect of the invention, locking means are provided to selectively maintain the door in a locked open or closed position.

According to another aspect of the invention, two push blocks are provided and adapted for engagement with the door to selectively rotate the container with the door.

One advantage of the invention is found in the simplified actuating mechanism for the door.

Another advantage of the invention resides in the adaptability and compatibility with existing automatic and manual manufacturing processes.

Yet another advantage of the invention resides in the automatic "hands-off" control of the door and resultant safety features associated therewith.

Yet another advantage of the invention is found in the reduced labour costs of manufacturing and operation of the container assembly.

The invention is further described, by way of example, with reference to the accompanying drawings, wherein:

Fig.1 is a perspective view of a rotatable container assembly and drive means and support structure associated therewith, in accordance with the present invention;

Fig.2 is an interior end view of an interior face of a gear used with the container of Fig.1;

Fig.3 is an end view of the container, particularly illustrating an end plate portion of the door in co-operating relation with a pair of push blocks;

Fig.4A is a front elevational view of the rotatable container assembly with the door in a fully open position;

Fig.4B is an end view of the right-hand end of Fig.4A particularly illustrating the orientation of the door and gear;

Fig.5A is a front elevational view of the rotatable container assembly with the door in an intermediate position;

Fig.5B is an end elevational view of the right-hand end of Fig.5A;

Fig.5C is an end elevational view of the right-hand end of Fig.5A at a further point in the door movement;

Fig.6A is a front elevational view of the rotatable container assembly particularly showing the door in a closed position;

Fig.6B is an end elevational view of the right-hand end portion of Fig.6A;

Fig.7 is a perspective view of a modified door and gear in accordance with the invention;

Fig.8 is a perspective view of a trunnion member used with the container in accordance with the invention;

Fig.9 is a cross-sectional view along the lines 9-9 of Fig.10;

Fig.10 is a cross-sectional view along the lines 10-10 of Fig.9; and

Figs.11 to 16 generally illustrate the interacting forces in maintaining the door in an open or closed position.

Referring now to the drawings, a support structure A supports a container assembly B which is commonly referred to as a treatment or plating barrel assembly. The support structure A is adapted to be supported across a tank or bath of treating solution (not shown) or a series of treating tanks if so desired. The container assembly is selectively immersed in the treating tank for treatment of workpieces retained in the container assembly. Further discussion of the overall plating process is unnecessary to an understanding of the present invention.

With reference to Fig.1, the support structure A includes an elongated channel member 10 which is connected at its ends to downwardly extending hanger arms or legs 12,14. A drive means, such as an electric motor or the like (not shown) is adapted to drivingly engage drive shaft 16 and drive gears 18 disposed adjacent the ends thereof. An idler head 20 is interposed between each drive gear 18 and a respective driven gear which will be described in greater detail below. An identical drive gear and idler gear arrangement is arranged at each end of the container assembly and provides simultaneous, synchronized drive of the assembly at opposed ends. Also, alternative drive means may be employed.

A container, such as a barrel or drum 30, includes a generally cylindrical sidewall 32 extending longitudinally between spaced end members or head ends 34,36. The sidewall may be formed as a continuous structure, or preferably, is formed from a plurality of planar members 38 arranged in a hexagonal or octagonal relationship. The term "generally cylindrical container" will be understood to include any of these defined structural relationships. The container is rotatable supported between hanger arms 12 and 14 and extends in generally parallel relation with the channel member 10. The sidewall 32 is preferably of perforated construction to allow treatment fluid to readily pass through the sidewall and, if used for electroplating, allow electric current flow.

An aperture or opening 40 is defined in a minor portion of the side wall 32. In the planar panel arrangement, one of the panels is removed or left out of the structure to define the aperture 40. The

aperture provides for ingress to and egress from a work cavity or central chamber 42. The aperture is of sufficient size to easily enable insertion and removal of the workpieces into and from the work cavity 42. In the preferred embodiment, the aperture comprises approximately 1/6 of the total surface area of the container, although other dimensions and ratios can be used with equal success.

A door 44 includes an elongated portion 46 and a pair of radially extending end plates 48,50 as further illustrated in Fig.3. The elongated portion 46 is designed to completely cover the aperture in a closed position while the end plates 48,50 are disposed axially outwards of the head ends 34,36 for close fitting relation therewith. The elongated portion 46 of the door may include longitudinally extending strengthening members 52, such as steel or the like, encapsulated within the plastic material of the door when corrosive solutions are involved. The strengthening members 52 enhance the rigidity of the door.

With further reference to Figs.2 and 3, the actuating mechanism for positioning the door in an open position away from aperture 40 and a closed position substantially covering the aperture will be further described. A driven gear 60 is disposed at one end of the container 30. As indicated above, a similar driven gear 62 is operatively disposed at the other end of the container. Therefore, the numerals and description of the various elements and relationships of driven gear 62 will apply equally to driven gear 60 unless particularly noted otherwise. The gear 62 has peripherally arranged drive teeth 64 adapted for meshing engagement with peripheral teeth on idler gear 20.

An interior face 66 of the gear 62 is disposed in facing relation with the head end 36 of the container while the interior face of gear 60 is in facing relation with head end 34. The interior face 66 of the gear 62 is clearly illustrated in Fig.2. It contains a cam slot or groove 68 having a predetermined pattern. A first portion of the cam slot defines an arcuate length 70 at a generally constant radius from a central opening or mounting aperture 72. A crest portion 74 is interposed between the constant radius portion 70 and a portion 76 of varying radius. The crest portion 74 defines a path which extends radially outwardly from the constant radius portion while the radially varying portion 76 defines a sloping path which spirals inwardly towards mounting aperture 72.

The drive gear 62 also includes first and second push dogs or door locks 84,86. The precise function of the combination push dogs/door locks will be described in further detail hereinbelow.

With particular reference to Fig.3, a view of the cylindrical container head end 36 and a door end plate 50 is illustrated. The head end 34 and door end plate 48 disposed at the left-hand portion of the container in Fig.1 are of identical construction and function in a similar manner as head end 36 and end plate 50 unless noted otherwise. The head end is of generally circular configuration and includes first and second push blocks 88,90 extending axially outwardly therefrom. The push blocks 88,90 are arranged adjacent a peripheral portion of the head end 36 and positioned at a preselected angular configuration adapted to enable the door-open and door-closed positions to be achieved, as will become more apparent below. A central hub or trunnion 92 is closely received through the head end 36 through a central aperture (not shown) and the external surface of the trunnion co-operates with a conventional bushing or bearing 93, three of which are utilized in the preferred embodiment for rotary movement of the container assembly therearound. End plate 50 is designed for abutting engagement with push block 90 in the fully open position as shown in Fig.4B while Fig.3 illustrates engagement with push block 88 in the closed position.

Further, a cam follower 94 extends axially outwardly from each end plate 48,50 towards respective gears 60,62. The cam follower 94 of each end plate is designed for receipt in the respective cam slot 68 in the inner face of drive gears 60,62. The co-operating end plates and gears define a means for imparting generally arcuate movement and generally radial movement to the door as will be detailed below. More particularly, the cam slot 68 and cam follower 94 define a cam means for actuating movement of the door. Each cam follower includes a high-density, self-lubricating member 96 peripherally arranged on the cam follower to facilitate sliding/rolling contact with the cam slot.

Further, an elongated generally rectangular aperture 102 is provided in each of the end plates and slidingly receives a slide block 104 therein. Once again, description of the right-hand end plate 50 is equally applicable to the structure of end plate 48 unless particularly noted otherwise. Preferably, the slide block 104 and elongated aperture 102 have a co-operating tongue and groove arrangement 106 adapted for ease of radial movement of the slide block relative to the end plate. The slide block 104 has a central aperture 108 with bearing 93 designed for rotative mounting on trunnion 92. The end plate 50 also has door locking notches 110, 112, 114 and 116. The door locking notches are peripherally arranged on the end plate and adapted for alternately receiving the combination push dogs/door locks 84,86 therein. Further, closing member 120 is positioned at the base of the end plate 50 at an area distally arranged from the elongated portion 46 of the door.

In mounting the door onto trunnion 92, the slide block 104 is initially positioned on the trunnion adjacent head end 36 of the container. Next, the end plate 50, with the closing member 120 removed therefrom, is radially positioned over the slide block. The co-operating tongue and groove engagement between the slide block and end plate facilitate mounting. The closing member 120 is thereafter secured to the end plate to limit the radially outward movement of the door relative to the container 30. The closing member also reinforces the end plate and retains alignment of the tongue/groove arrangement 106.

During operation of the door, the slide block remains stationary relative to the trunnion and rotated with the door. Nevertheless, the remainder of the end plate 50 undergoes radial inward and outward movement relative to the slide block as a result of the cam-actuated movement. In this manner, the door 44 moves from a radially outer open position (see Fig.4B) to a radially inner closed position (see Fig.6B).

As indicated above, the push blocks 88,90 are peripherally arranged on head 36 of the container assembly. More specifically, the circumferential arc length between the push blocks 88,90 is approximately twice the width of door 44. Thus, in the illustrated open position of Figs.4A and 4B, the aperture 40 is completely exposed and end plate 50 is in abutting engagement with push block 90.

The head end 36 includes a radially recessed portion 122 (Fig.3) adapted to receive the elongated portion 46 of the door in the open position of the door. As will become more apparent, this assures a compact arrangement of the door with the container 30 in an open position and further prevents any interference with the drive shaft 16 or other portion of the support structure. This also provides compactness of the entire container assembly.

Turning now to Figs. 4A and 4B, the open position of the door relative to the container and, specifically, aperture 40 will be described in detail. This is also known as the load position of the container assembly in which the aperture 40 is generally facing angularly upwardly for receipt of particulate workpieces. This position also assists an operator in viewing the loading of the container. The door 44 abuttingly engages push block 90 and is positioned at a radially outer position i.e, the slide block is closely adjacent the closing member 120 in end plate 50. Further, the combination push dog/door lock 86 is received in the door locking notch 110. Similarly, the combination push dog/door lock 84 is received in door locking notch 114. The cam follower 94 is received in the constant radius portion 70 of the cam slot. The cam slot and cam follower of the gear and door, respectively, provide for relative positioning both radially and arcuately between the container and the door.

In the open position, the container is loaded with particulate workpieces through aperture 40. The aperture is sufficiently large to permit quick loading of a large number of workpieces. The specific loading mechanism forms no part of the invention and further discussion is unnecessary to an understanding of the invention.

With reference to Figs. 5A, 5B and 5C intermediate closing positions of the door relative to the container are shown. More specifically, counterclockwise movement of the drive gear as illustrated in Fig.5B will advance the cam follower to the crest portion 74 of the cam slot, whilst the door remains against the push block 90. During this portion of the movement, the drive gears rotate relative to both the door and the container. At this point, further counter-clockwise rotation of the gears will, in turn, rotate the door away from push block 90 and towards engagement with push block 88 due to abutting engagement between the cam follower 94 and the crest portion 74. The continued counterclockwise rotation is defined by simultaneous movement of the drive gears and the door and both members rotate relative to the container. Upon engagement of the door with push block 88, cam follower 94 is advanced radially outwardly over the crest portion of the cam slot. Accordingly, the door moves radially outwardly with the aperture 40 and will next undergo a radially inward movement.

Further counter-clockwise rotation of the gears as shown moves the cam follower through the radially varying portion 76 of the cam slot. Associated with this action, is the radially inward movement of the door towards the aperture 40. Likewise, the combination push dogs/door locks 84,86 continue to move away from door locking notches 110,114 and towards the door locking notches 112,116 (Fig.5C). Once the cam follower has reached a predetermined position in the radially varying portion 76 of the cam slot away from the crest portion 74, the combination push dogs/door locks 84,86 abuttingly engage the other pair of door locking notches 112,116. Thus, as illustrated in Figs. 6A and 6B, the door has moved radially inwardly into a seated position and covers the aperture 40. Any further counter-clockwise movement of the gear causes simultaneous rotation of the door and the container together. This would correspond to the loaded condition of the container assembly in which it undergoes a submersion and tumbling or cascading of the workpieces retained in the work cavity.

Upon completion of the predetermined duration in the treatment tank, the container is locked in place and removed from the tank. Further rotation in a counter-clockwise direction orients the con-

tainer essentially as shown in Fig.6B. The drive gears are now rotated in a clockwise manner as shown until the door opens relative to the aperture in a reverse manner from that described above. The door moves radially outwardly as the cam follower 94 proceeds through the radially varying portion 76 of the cam slot towards the crest portion. Once the cam follower reaches the crest portion 74 of the cam slot, the gear and door rotate together away from push block 88 and towards push block 90. Upon abutting engagement with the push block 90, the cam follower passes over the crest portion and into the constant radius portion 70 of the cam slot. Accordingly, during this procedure, the combination push dogs/door locks 84,86 have also moved from engagement with locking notches 112,116 to the locking notches 110,114. At this point, the aperture is completely uncovered and further clockwise rotation, as shown, of the cylindrical container 30 enables emptying the contents from the work cavity. That is, the aperture is rotated in a clockwise direction until it faces downwardly. Once the contents are emptied, the clockwise rotation continues until the aperture is positioned in an angularly upward position for the next loading of workpieces (Fig.4A).

As is apparent from the above description, an operator of the plating container 30 can be located in a "hands-off" position where he is safely clear of the loading and unloading operation of the barrel. There is no requirement for any manual contact with the door and the radially inward movement of the door with respect to the aperture eliminates any gaps therebetween and prevents any particulate workpieces from falling out. This arrangement also eliminates any need for springs or clamping arrangements to retain the door in a closed position with the aperture. The motor is only required to be of the reversing type and no special controls are required. The complete opening and closing action of the door is governed by the rotation of the gears and the cam follower tracking in the cam slot along with the door and push block engagement as well as the combination push dog/door lock and end bracket engagement. Further, only the weight of the door is loaded on the cam follower and cam slot.

Referring now to a modified door as illustrated in Fig.7, and for ease of illustration, like elements are identified by like numerals with a primed (′) suffix and new elements are defined by new numerals. The modified door 44′ includes an elongated portion 46′ reinforced by use of encapsulated or encased strengthening members 52′ which extend along the longitudinal length of the door. Opposed end plates 48′,50′ are disposed in a generally perpendicular relation with respect to the elongated portion 46′. A cam follower 94′ extends axially outwardly from each of the end plates 48′,50′. In much the same manner as described above, the cam follower 94′ of each end plate is designed for co-operating relation with an inwardly facing cam slot on an interior face of opposed driven gears, only one of which is shown for ease of illustration. In the embodiment of Figs. 1 to 6, an elongated aperture receives a slide block for permitting radial movement of the door with respect to trunnion 92. The preferred arrangement is designated for extreme wear conditions so that the wear resulting from the radially inward and outward movement of the door is dispersed over the tongue and groove arrangement of the slide block and end plate.

In the modified arrangement of Fig.7, an elongated aperture 102′ is defined in each of the end plates and has a generally elliptical configuration. The minor axis of the ellipse generally conforms to the outer diameter of raised portion 122 of the drive gear 62′. In this manner, wear between the relatively moving parts is not distributed over as great a surface area. Nonetheless, this arrangement is more than satisfactory for most industrial applications and significantly decreases the complexity as well as machining and assembly costs. The end plates still utilize door locking notches 110′, 112′, 114′, and 116′ and encased steel reinforcement 52′. In all other respects, the modified door arrangement of Fig.7 functions in approximately the same manner as that described with the preferred embodiment of Figs. 1 to 6.

The trunnion 92 is particularly illustrated in Fig.8 and, as described above, is fixedly mounted to a support hanger arm 12 or 14. As illustrated, the trunnion has a generally cylindrical configuration with an aperture extending generally longitudinally therethrough. The aperture 124 is centrally positioned at a first or outer end 126 but is eccentrically disposed at a second or inner face 128. The trunnion aperture is designed to receive a dangler therethrough. The dangler will thereby maintain a generally downwardly angled disposition and not migrate appreciably upwardly with workpieces during rotation of the container, notwithstanding virtually constant impinging contact with the workpieces.

As is well known in the art, when used for electroplating the danglers are provided to supply the high current or throwing power necessary to effect plating of the workpieces. An electric current induced through the danglers charges the workpieces through contact therewith. As the container is rotated, the workpieces to be plated are continuously exposed to a relatively uniform high current field by repeated rotation and exposure to one of the danglers or by conduction through other workpieces. The presence of the electric current caused

migration of the plating ions to the workpieces.

Turning now to Figs. 9 and 10, the advantageous arrangement of the door with respect to the aperture will be described in greater detail. The elongated portion 46 of the door is of rebated design so that it fully seats within the aperture 40. As shown in Fig.9, a pair of axially extending door ribs 140,142 receive two perforated panels 144,146 defining a portion of the container sidewall. The ribs each define a recessed step portion 148,150 which, in turn, matingly receives a stepped or rebated lower surface 152 of the door. In a fully closed position, the step portions 148,150 abuttingly support the door so that particulate workpieces in the container are retained therein.

Similarly, and with reference to Fig.10, the elongated portion 46 of the door also includes an axial step surface 154 which closely accommodates a head end. The stepped mating configuration facilitates retention of the workpieces in the work cavity.

Yet another advantageous feature is provided by the illustrated embodiments of the invention. Referring now to Figs. 11 to 13, the dumping sequence of the container is shown. In Fig.11, the container has completed the treatment process of the workpieces W and the aperture 40 is positioned in an angularly upward loading position. The door opening process is completed and further clockwise rotation of the container as shown orients the aperture in a downward position. As particularly detailed in Fig.12, the workpieces have a tendency to "climb" along the left-hand portion of the work cavity as rotation of the container continues. The workpieces tend to exert a counter-clockwise torque or rotation on the container which is opposed to the clockwise rotation of the gear. Thus, the combination push dogs/door locks tightly engage the door locking notches 110,114 and the end plate abuts push block 90.

The sequence of Figs. 14 to 16 depicts the tumbling action of the workpieces once the container has been loaded, the door closed over the aperture, and the container rotated in a counter-clockwise direction as shown for treating in a treatment tank. During the counter-clockwise rotation, the workpieces migrate up the right-hand side of the work cavity thereby imposing a clockwise torque or rotation on the container. The shift in weight to an uneven distribution eccentrically positions the centroid of the workpieces towards the right-hand portion of the container in relation to the axis of rotation defined through the trunnion. The combination push dogs/locking pins now tightly engage the door locking notches 112,116 and the end plate abuts push block 88. Thus, the open position and the closed position of the door are enhanced by the force and torque exerted by the workpieces.

Claims

1. A rotatable container assembly for use in the surface treatment of particulate workpieces selectively enclosed therein, said container assembly (B) comprising a generally cylindrical container (30) having cylinder head ends (34,36) retained in axially spaced relation by a sidewall (32) and a work cavity (42) defined therein, an aperture (40) being formed in a minor portion of said sidewall (32) for ingress to and egress from said work cavity (42) and a door (44) for said aperture (40); characterised in that the door (44) includes an elongated portion (46) adapted for selective covering relation with said aperture (40) and at least one door end plate (48,50) extending generally perpendicular from said elongated portion (46) and operatively engaging said container (30) and in that a gear (60,62) in facing relation with said end plate (48,50) has a cam slot (68) or cam follower co-operating with a cam follower (94) or a cam slot on said end plate (48,50) and adapted to impart arcuate and radial movement to said door (44) for selective covering of said aperture (40).

2. A container assembly as claimed in claim 1, wherein for said selective coverage said cam slot (68) and said cam follower (94) actuate said door (44) from a first open position relative to said aperture (40) along a first generally arcuate path and then along a second generally radial path to a closed position relative to said aperture (40).

3. A container assembly as claimed in claim 1 or 2, wherein said cam follower (94) is on said door end plate (48,50).

4. A container assembly as claimed in any of claims 1 to 3, wherein said container (30) remains generally stationary during movement between the open position and the closed position of said door (44).

5. A container assembly as claimed in any of claims 1 to 4, wherein at least one of said opposed head ends (34,36) includes first and second push blocks (88,90) for selectively retaining said door (44) and said container (30) in fixed relative position.

6. A container assembly as claimed in any preceding claim, wherein said door (44) includes means (102,104) for allowing the generally radial movement while remaining operatively connected to said container (30).

7. A container assembly as claimed in claim 6, wherein said radial movement-allowing means includes an elongated cutout (102) adapted for sliding engagement with a trunnion (92) fixedly engaged on said container (30).

8. A container assembly as claimed in claim 7, wherein said elongated cutout (102) operatively receives a slide block (104) in which the trunnion (92) is relatively rotatably received.

9. A container assembly as claimed in any preceding claim, further comprising door locking means (84,86,110,112,114,116) adapted for selectively maintaining said door (44) in the open and closed positions.

10. A container assembly as claimed in claim 9, wherein said locking means includes door locking notches (110,112,114,116) peripherally arranged on said door end plate (48,50).

11. A container assembly as claimed in claim 10, wherein said locking means is provided with the gear (60) having a lock member (84,86) extending therefrom and adapted for alternate operative engagement with selected door locking notches (110,112,114,116).

12. A container assembly as claimed in any preceding claim, wherein at least one of said head ends (34,36) provided with the first and second push blocks (88,90) is adapted for engagement with said door (44) to rotate said container (30) with said door (40).

13. A container assembly as claimed in any preceding claim, wherein at least one of said head ends (34,36) has a reduced dimension peripheral portion adapted to receive said door in an open position.

14. A container assembly as claimed in any preceding claim, wherein said cam slot (68) includes a crest portion (74) enabling a rotary motion to be imparted to the door (44).

15. A container assembly as claimed in any preceding claim, wherein said door (44) is attached to the container (30) in both open and closed positions.

Revendications

1. Système de récipient rotatif utilisable pour le traitement de surface de pièces distinctes en vrac sélectivement contenues dans le récipient, ledit système de récipient (B) comprenant un récipient sensiblement cylindrique (30) à fonds de cylindre (34,36) retenus en relation axialement espacée par une paroi latérale (32) et une cavité de travail (42) définie intérieurement, une ouverture (40) étant formée dans une partie mineure de ladite paroi latérale (32) pour l'entrée et la sortie de ladite cavité de travail (42), et une porte (44) de recouvrement de ladite ouverture (40), caractérisé en ce que la porte (44) comprend une partie allongée (46) permettant le recouvrement sélectif de ladite ouverture (40), et au moins une plaque d'extrémité de porte (48,50) s'étendant sensiblement perpendiculairement à partir de ladite partie allongée (46) et venant fonctionnellement en contact avec ledit récipient (30), et en ce qu'un engrenage (60,62) en relation face-à-face avec ladite plaque d'extrémité (48,50) comporte une rainure de came (68) au un palpeur de came coopérant avec un palpeur de came (94) ou une rainure de came sur ladite plaque d'extrémité (48,50) et permettant de communiquer un mouvement angulaire et radial à ladite porte (44) pour le recouvrement sélectif de ladite ouverture (40).

2. Système de récipient suivant la revendication 1, dans lequel, pour ledit recouvrement sélectif, ladite rainure de came (68) et ledit palpeur de came (94) actionnent ladite porte (44) d'une première position ouverte par rapport à ladite ouverture (40), le long d'un premier chemin sensiblement courbe puis le long d'un deuxième chemin sensiblement radial, à une position fermée par rapport à ladite ouverture (40).

3. Système de récipient suivant la revendication 1 ou 2, dans lequel ledit palpeur de came (94) est prévu sur ladite plaque d'extrémité de porte (48,53).

4. Système de récipient suivant l'une quelconque des revendcations 1 à 3, dans lequel ledit récipient (30) reste sensiblement fixe pendant le mouvement de ladite porte (44) entre la position ouverte et la position fermée.

5. Système de récipient suivant l'une quelconque des revendications 1 à 4, dans lequel au moins un desdits fonds opposés (34,36) comprend un premier et un deuxième blocs de poussée (88,90) pour retenir sélectivement ladite porte (44) et ledit récipient (33) en position relative fixe.

6. Système de récipient suivant l'une quelconque des revendications précédentes, dans lequel ladite porte (44) comprend des moyens

(102,104) pour permettre le mouvement sensiblement radial tout en restant fonctionnellement reliée audit récipient (30).

7. Système de récipient suivant la revendication 6, dans lequel lesdits moyens permettant le mouvement radial comprennent une découpe allongée (102) prévue pour engagement coulissant avec un tourillon (92) prévu de façon fixe sur ledit récipient (30).

8. Système de récipient suivant la revendication 7, dans lequel ladite découpe allongée (132) reçoit fonctionnellement un bloc coulissant (134) dans lequel le tourillon (92) est reçu en rotation relative.

9. Système de récipient suivant l'une quelconque des revendications précédentes, comprenant en outre des moyens de verrouillage de porte (84,86,110, 112,114,116) prévus pour maintenir sélectivement ladite porte (44) dans les positions ouverte et fermée.

10. Système de récipient suivant la revendication 9, dans lequel lesdits moyens de verrouillage comprennent des encoches de verrouillage de porte (110, 112,114,116) périphériquement prévues sur ladite plaque d'extrémité de porte (48,50).

11. Système de récipient suivant la revendication 10, dans lequel lesdits moyens de verrouillage sont prévus avec l'engrenage (60) qui comporte un élément de verrouillage (84,86) s'étendant à partir de l'engrenage et pouvant s'engager activement de façon alternée dans des encoches choisies de verrouillage de porte (110, 112,114,116).

12. Système de récipient suivant l'une quelconque des revendications précédentes, dans lequel au moins un desdits fonds (34,36) comportant les premier et deuxième blocs de poussée (88,90) peut venir en prise avec ladite porte (44) pour faire tourner ledit récipient (30) avec ladite porte (40).

13. Système de récipient suivant l'une quelconque des revendications précédentes, dans lequel au moins un desdits fonds (34,36) comporte une partie périphérique de dimension réduite prévue pour recevoir ladite porte en position ouverte.

14. Système de récipient suivant une quelconque des revendications précédentes, dans lequel la dite rainure de came (68) comprend une rampe (74) permettant de communiquer un mouvement rotatif à la porte (44).

15. Système de récipient suivant l'une quelconque des revendications précédentes, dans lequel ladite porte (44) est reliée au récipient (30) à la fois dans la position ouverte et la position fermée.

Patentansprüche

1. Drehbare Behälteranordnung zur Verwendung bei der Oberflächenbehandlung von teilchenförmigen Werkstükken, die selektiv darin eingeschloßen sind, wobei die Behälteranordnung (B) einen insgesamt zylindrischen Behälter (30), der Zylinderkopfenden (34, 36), welche in einer axialen Abstandsbeziehung von einer Seitenwand (23) gehalten sind, und einen darin ausgebildeten Arbeitshohlraum (43) hat, eine Öffnung (40), die in einem kleineren Abschnitt der Seitenwand (32) für den Zugang zu und den Auslaß aus dem Arbeitshohlraum (42) ausgebildet ist, und eine Tür (44) für die Öffnung (40) aufweist, **dadurch gekennzeichnet,** daß die Tür (44) einen langgestreckten Abschnitt (46), der für eine selektive Abdeckbeziehung mit der Öffnung (40) geeignet ist, und wenigstens eine Türstirnplatte (48, 50) aufweist, die sich insgesamt senkrecht von dem langgestreckten Abschnitt (46) aus erstreckt und in Wirkungseingriff mit dem Behälter (30) steht, und daß ein Zahnrad (60, 62), das in einer zugewandten Beziehung zu der Stirnplatte (48, 50) steht, einen Nockenschlitz (68) oder einen Nockenstößel aufweist, der mit einem Nockenstößel (94) oder einem Nockenschlitz an der Stirnplatte (48, 50) zusammenwirkt und geeignet ist, der Tür (44) für die selektive Abdekkung der Öffnung (40) eine bogenförmige und radiale Bewegung zu erteilen.

2. Behälteranordnung nach Anspruch 1, bei welcher für die selektive Abdeckung der Nockenschlitze (68) und der Nockenstößel (94) die Tür (44) von einer ersten offenen Stellung bezüglich der Öffnung (40) längs einer ersten insgesamt bogenförmigen Bahn und dann längs einer zweiten insgesamt radialen Bahn in eine geschlossene Stellung relativ zu der Öffnung (40) bewegen.

3. Behälteranordnung nach Anspruch 1 oder 2, bei welcher der Nockenstößel (94) auf der Türstirnplatte (48, 50) angeordnet ist.

4. Behälteranordnung nach einem der Ansprüche 1 bis 3, bei welcher der Behälter (30) während

einer Bewegung zwischen der Offenstellung und der geschlossenen Stellung die Tür insgesamt stationär bleibt.

5. Behälteranordnung nach einem der Ansprüche 1 bis 4, bei welcher wenigstens eines der gegenüberliegenden Kopfenden (34, 36) erste und zweite Schubblöcke (88, 90) aufweist, um die Tür (44) und den Behälter (30) in einer festgelegten Relativposition selektiv zu halten.

6. Behälteranordnung nach einem vorhergehenden Anspruch, bei welcher die Tür (44) Einrichtungen (102, 104) aufweist, welche die insgesamt radiale Bewegung erlauben, während sie in Wirkungsverbindung mit dem Behälter (30) gehalten ist.

7. Behälteranordnung nach Anspruch 6, bei welcher die die radiale Bewegung erlaubenden Einrichtungen einen langgestreckten Ausschnitt (102) aufweisen, der für einen Gleiteingriff mit einem Drehzapfen (92) geeignet ist, der fest an dem Behälter (30) angreift.

8. Behälteranordnung nach Anspruch 7, bei welcher der langgestreckte Ausschnitt (102) einen Gleitblock (104) wirksam aufnimmt, in welchem der Drehzapfen (92) relativ drehbar aufgenommen ist.

9. Behälteranordnung nach einem vorhergehenden Anspruch, welcher weiterhin Türarretiereinrichtungen (84, 86, 110, 112, 114, 116) aufweist, die dafür geeignet sind, die Tür (44) selektiv in der offenen und geschlossenen Stellung zu halten.

10. Behälteranordnung nach Anspruch 9, bei welcher die Arretiereinrichtungen Türarretierkerben (110, 112, 114, 116) aufweisen, die am Umfang an der Türstirnplatte (48, 50) angeordnet sind.

11. Behälteranordnung nach Anspruch 10, bei welcher die Arretiereinrichtungen mit dem Zahnrad (60) versehen sind, das ein Arretierelement (84, 86) hat, welches sich davon aus erstreckt und geeignet ist, den Wirkungseingriff mit ausgewählten Türarretierkerben (110, 112, 114, 116) zu wechseln.

12. Behälteranordnung nach einem vorhergehenden Anspruch, bei welcher wenigstens eines der Kopfenden (34, 36), die mit den ersten und zweiten Schubblöcken (88, 90) versehen sind, für den Eingriff mit der Tür (44) geeignet ist, um den Behälter (30) mit der Tür (40) zu drehen.

13. Behälteranordnung nach einem vorhergehenden Anspruch, bei welcher wenigstens eines der Kopfenden (34, 36) einen Umfangsabschnitt mit reduzierter Abmessung hat, der geeignet ist, die Tür in einer offenen Stellung aufzunehmen.

14. Behälteranordnung nach einem vorhergehenden Anspruch, bei welcher der Nockenschlitz (68) einen Scheitelabschnitt (74) hat, der es ermöglicht, der Tür (44) eine Drehbewegung zu erteilen.

15. Behälteranordnung nach einem vorhergehenden Anspruch, bei welcher die Tür (44) an dem Behälter (30) sowohl in der offenen als auch in der geschlossenen Stellung festgelegt ist.

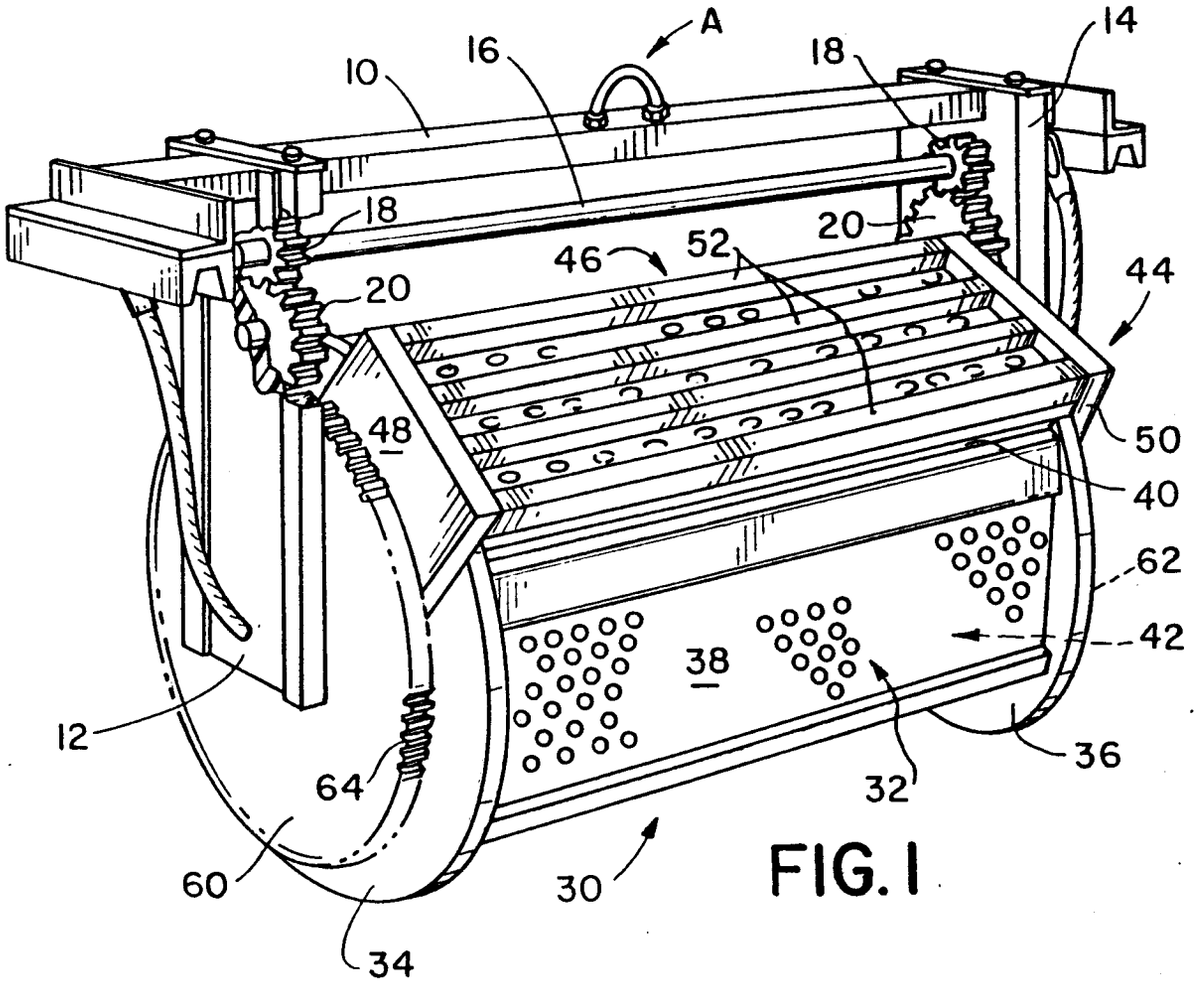


FIG. 1

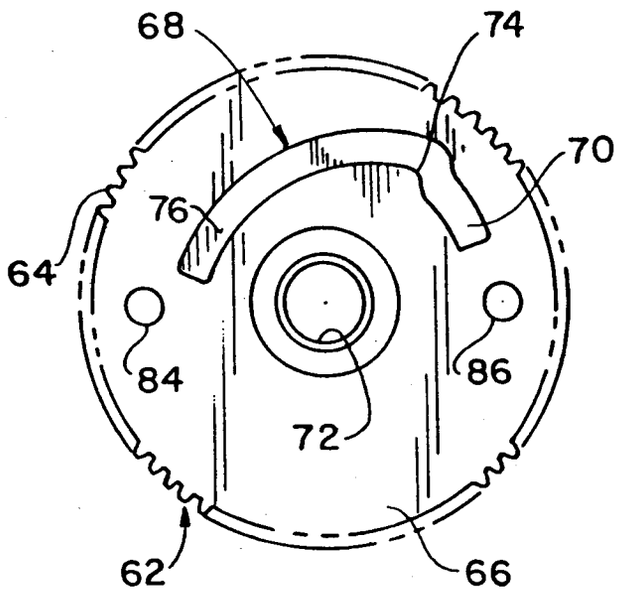


FIG. 2

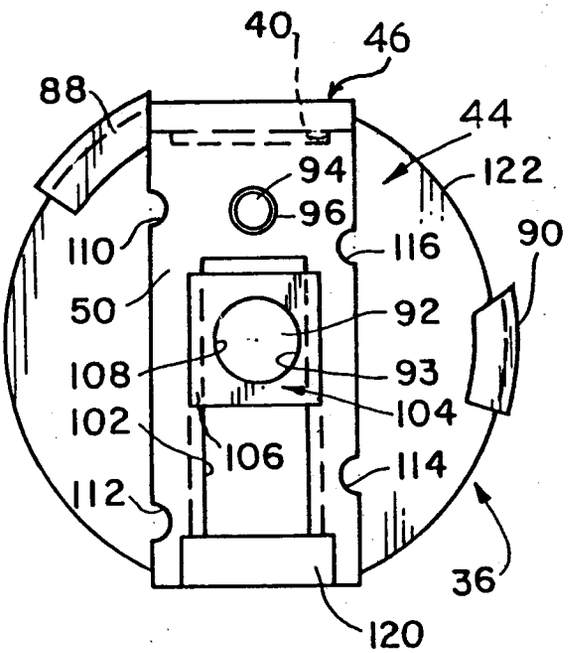


FIG. 3

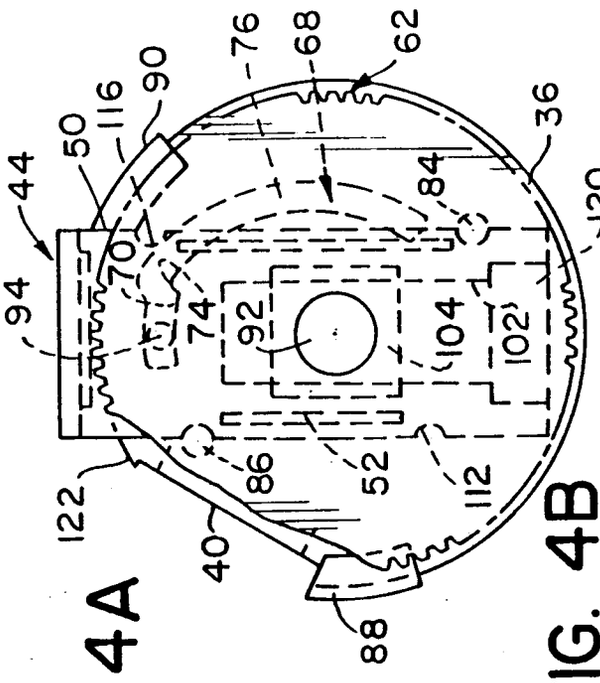


FIG. 4A

FIG. 4B

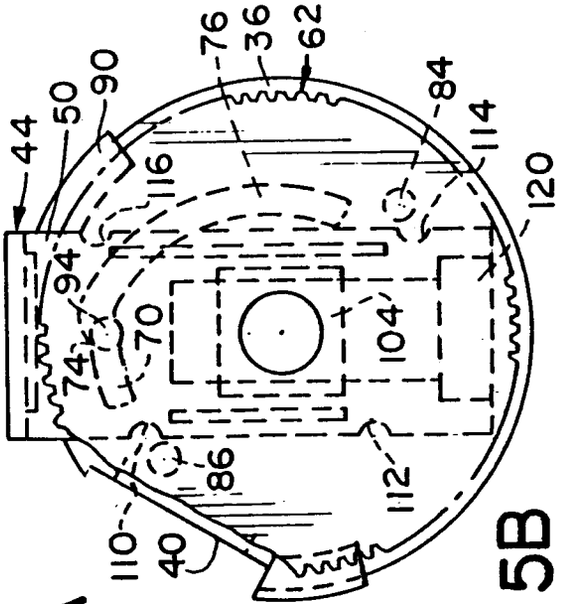
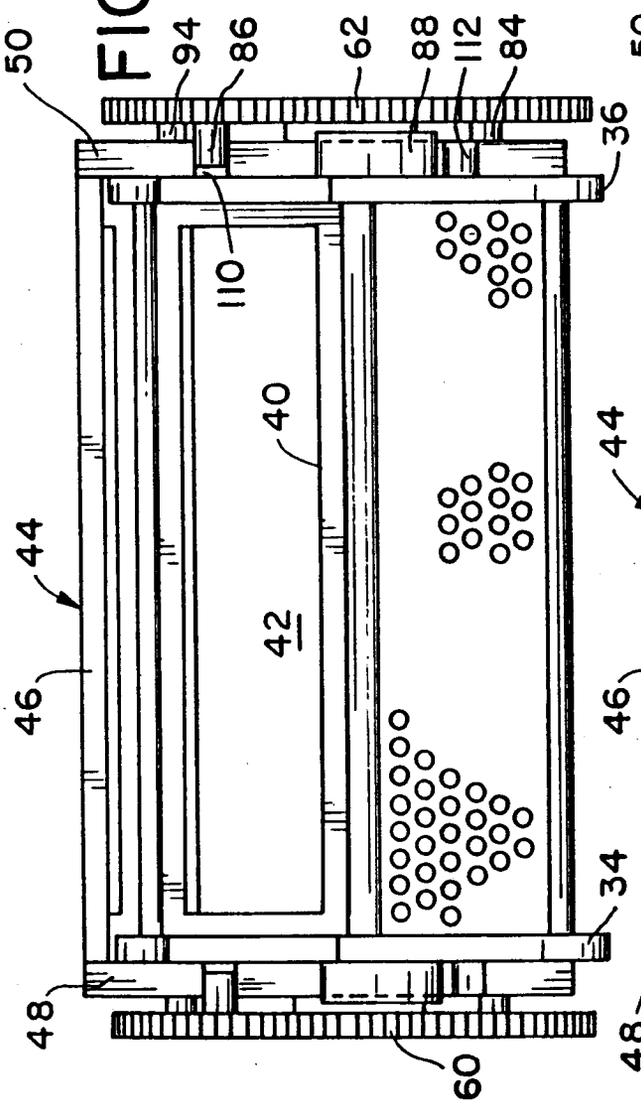
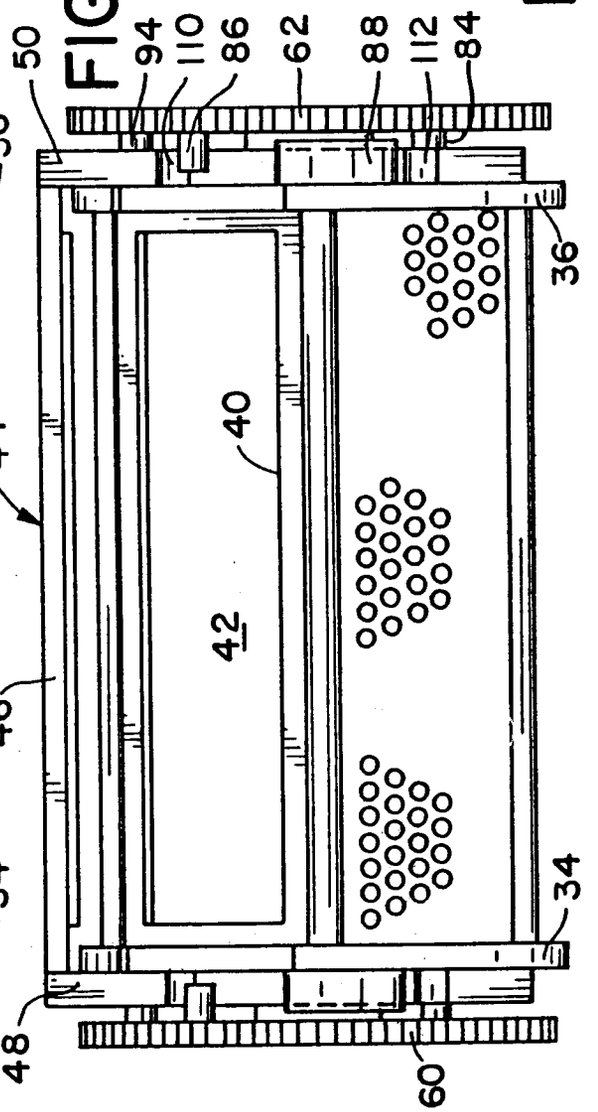


FIG. 5A

FIG. 5B





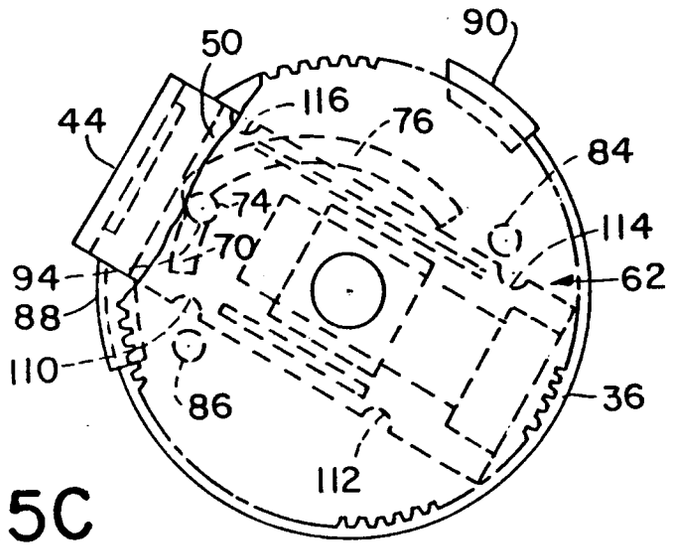


FIG.5C

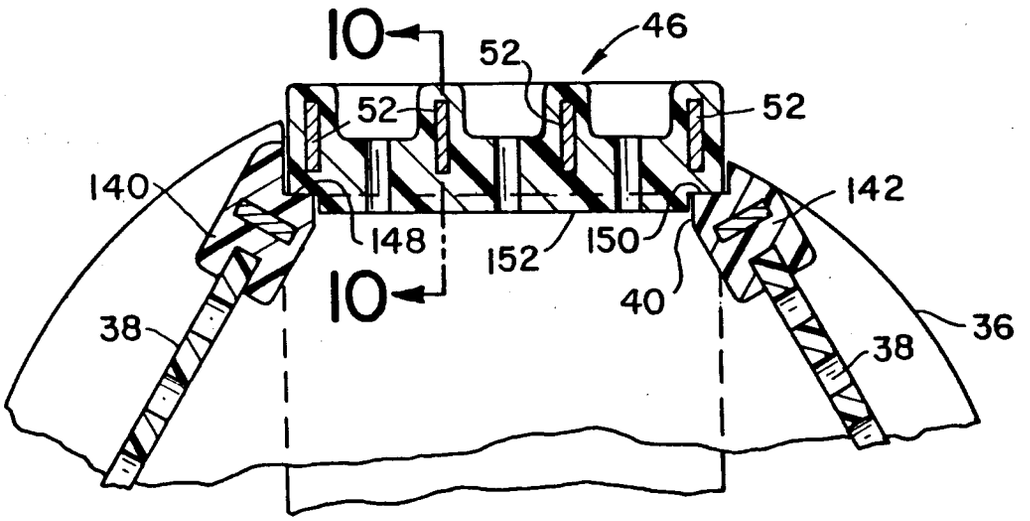


FIG. 9

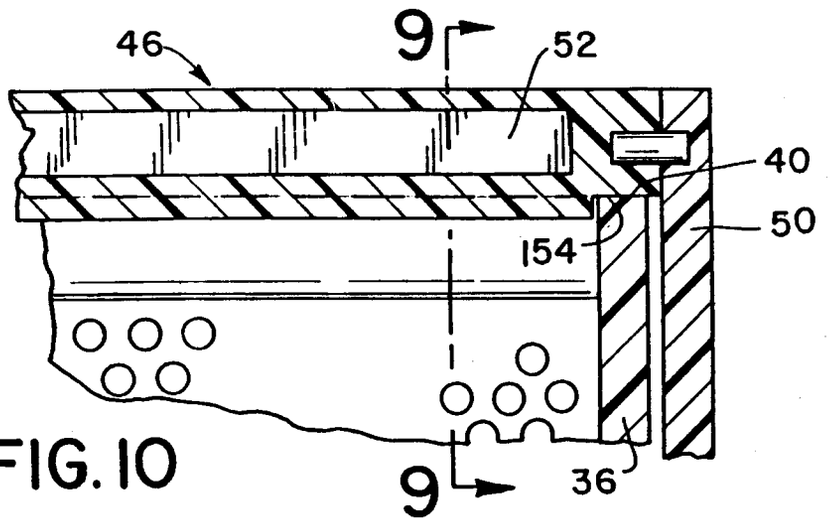
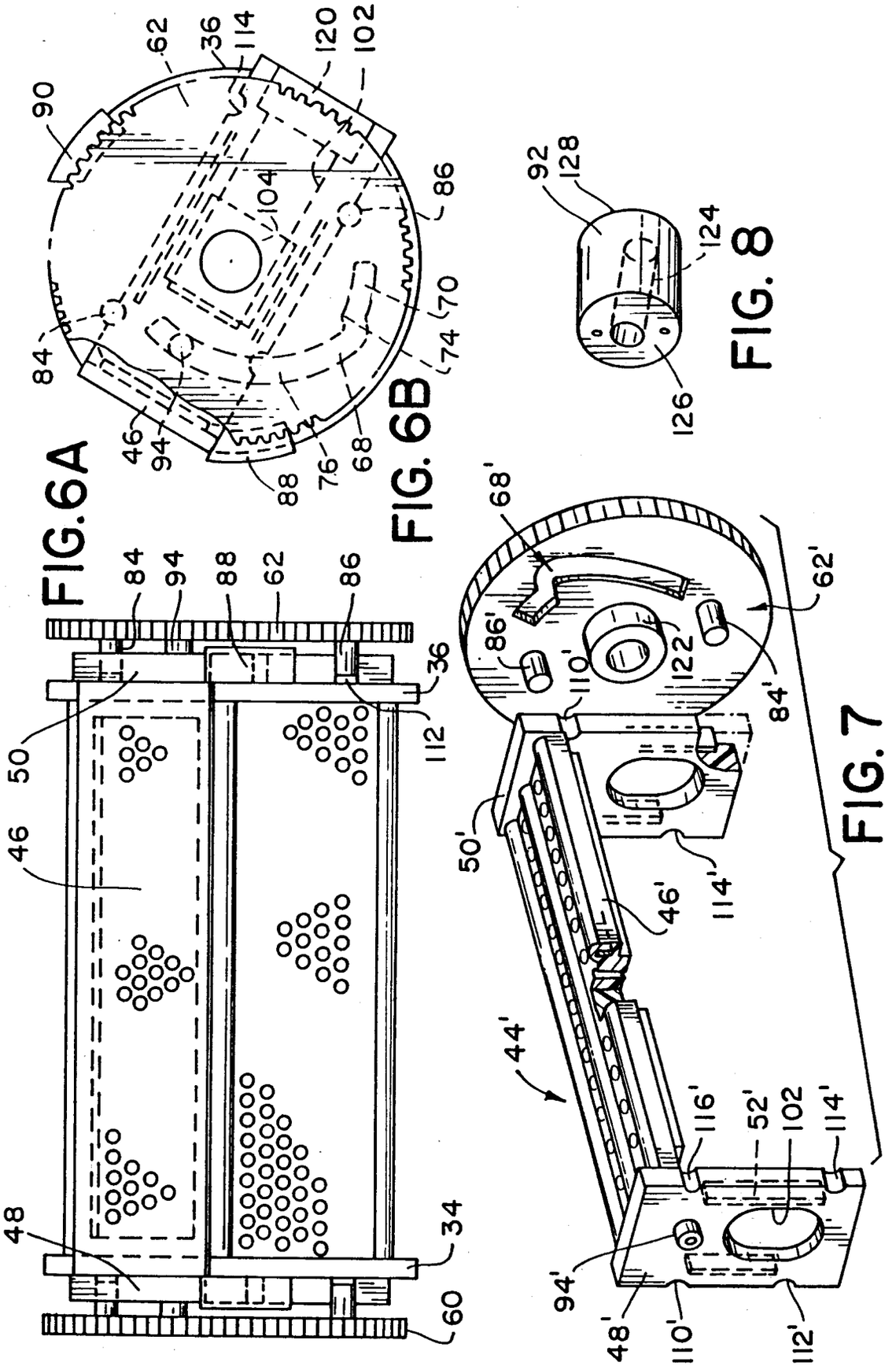


FIG. 10


62
36
114
120
102
90
104
86
84
70
74
46
94
88
76
68
FIG. 6B
92
128
124
126
FIG. 8
FIG. 6A
84
94
88
62
86
36
50
112
46
48
34
60
68'
62'
86'
122
110'
84'
50'
114'
46'
44'
116'
52'
102
114'
94'
48'
110'
112'
FIG. 7

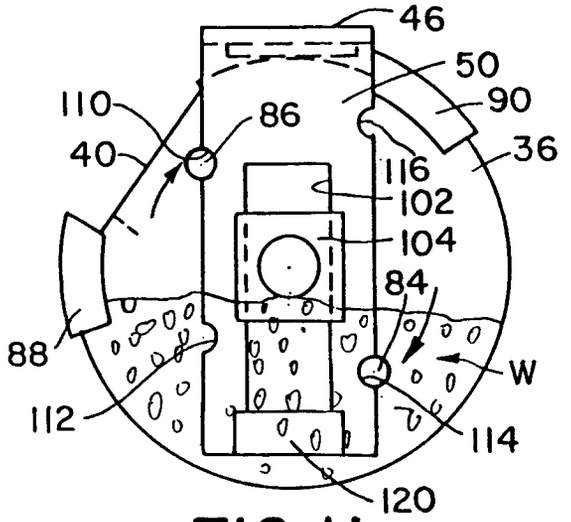


FIG. 11

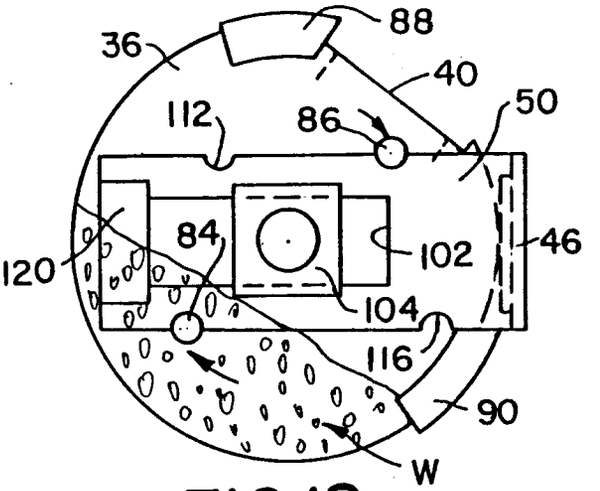


FIG. 12

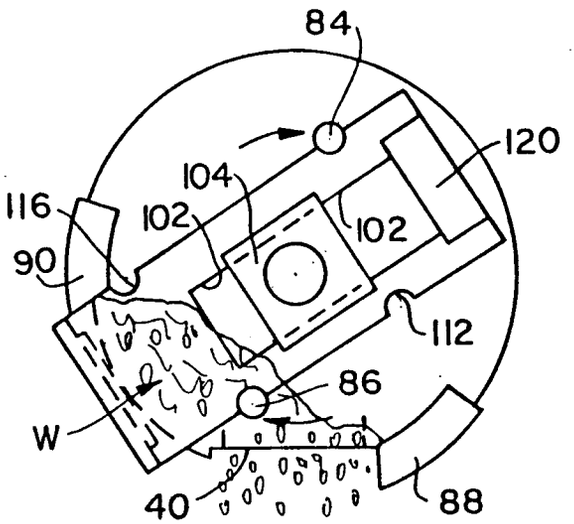


FIG. 13

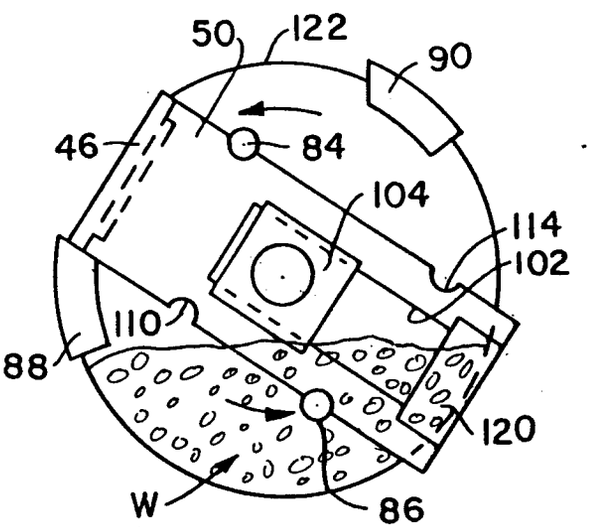


FIG. 14

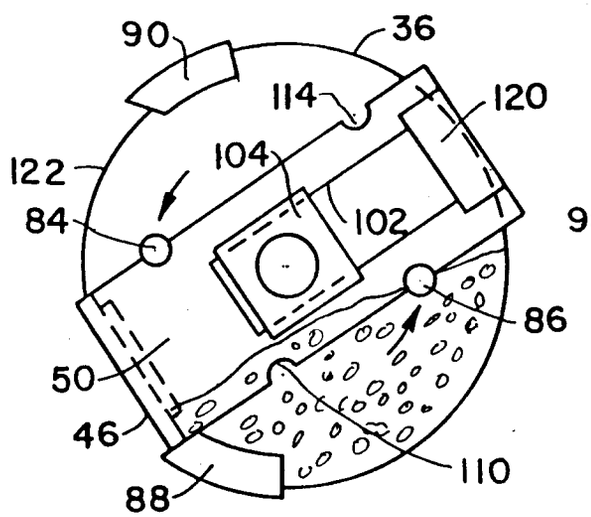


FIG. 15

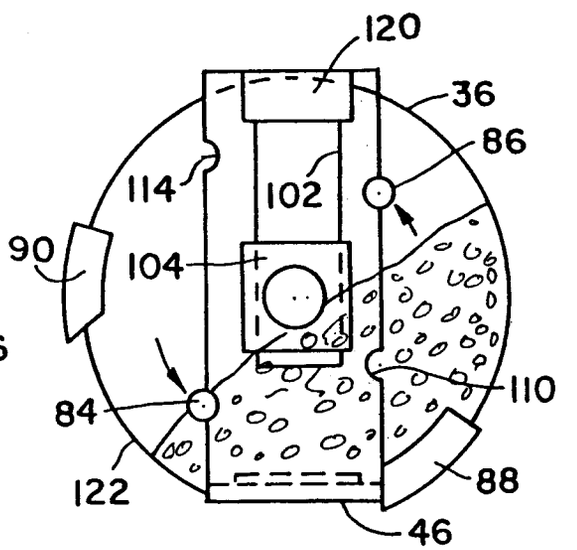


FIG. 16